BEFORE THE

FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, D.C. 20554

IN THE MATTER OF	)	
	)	
IMPLEMENTATION OF SECTIONS 3(n) AND 332 OF THE COMMUNICATIONS ACT	)	GN Docket No. 93-252
	)	
REGULATORY TREATMENT OF MOBILE SERVICES	)	

COMMENTS OF AIRTOUCH COMMUNICATIONS

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SUMMARY

AirTouch Communications ("AirTouch"), by its attorneys, hereby files these Comments in response to the Further Notice of Proposed Rule Making issued by the Commission on May 20, 1994.

In this proceeding, the Commission seeks, inter alia, to determine whether there is a "potential" for licensees of commercial mobile radio services ("CMRS") to exert market power by aggregating CMRS spectrum. The Commission proposes several alternative limits on the total amount of CMRS spectrum that may be licensed to a single entity in a geographic area. The Commission seeks comment on whether all CMRS spectrum should be included, regardless of whether the services provided compete or not. The Commission specifically asks whether satellite services should be included under the proposed cap. The Commission also requests views on its proposed five percent ownership-interest attribution rule.

AirTouch submits that to impose spectrum limits upon all CMRS services would be arbitrary and capricious and would lack any basis. The competitive concerns put forward by the Commission as the impetus for this spectrum-cap proposal are not applicable to this particular industry. AirTouch submits the views of three distinguished antitrust economists with extensive experience in telecommunications -- Professor Jerry A. Hausman, Professor R. Preston McAfee and Dr. Michael A. Williams -- in support of these comments. Furthermore, even if there were a basis for an initial choice of a spectrum limit, that basis would

be quickly eroded by the pace of developments in wireless services. Consequently, to further avoid acting arbitrarily and capriciously, the Commission would be required to monitor events and constantly adjust the limit.

While AirTouch believes that the Commission's proposed spectrum limitation is arbitrary, so long as it applies to the activities of cellular and PCS providers, the Commission must also apply it to competing ESMR providers; but no other CMRS services -- such as paging or satellite -- should be included in the cap.

Finally, AirTouch submits that the five percent attribution rule is overly restrictive and is likely to frustrate the Commission's goal of achieving a diverse array of services by limiting investment opportunities. By creating disincentives to investment and innovation, the Commission's proposed attribution rule will put U.S. providers of mobile services and equipment at a competitive disadvantage with respect to foreign firms which are not encumbered by such a restriction.

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COMMENTS OF AIRTOUCH COMMUNICATIONS

AirTouch Communications ("AirTouch"), by its attorneys, hereby files these Comments in response to the Further Notice of Proposed Rule Making issued by the Commission on May 20, 1994.[1/]

AirTouch, formerly PacTel Corporation, was recently spun-off from Pacific Telesis Group and is now a completely independent corporation. AirTouch is a major provider of cellular, paging and other wireless services in numerous markets across the United States.[2/] As a result, AirTouch has a strong interest in seeing that regulatory policies foster and facilitate competition and encourage rapid and efficient deployment of new technologies, products and services.

[1/] Further Notice of Proposed Rule Making, Implementation of Sections 3(n) and 332 of the Communications Act, Regulatory Treatment of Mobile Services, GN Docket No. 93-252, released May 20, 1994.

[2/] AirTouch Paging is filing separate comments in this proceeding that address paging-specific issues in more detail than discussed herein.

AirTouch is well qualified to assist the Commission in this proceeding by virtue of our extensive experience in providing customers with mobile services. AirTouch and affiliated entities operate state-of-the-art "regional" cellular networks in California, Michigan, Ohio, Georgia, Kansas and Missouri, including one of the country's largest systems in Los Angeles. All of these systems have experienced rapid growth and have required constant modification and innovation; for example, the Los Angeles system has grown from a handful of cell sites to over 300 today and has gone from one switch to four, including one of the first digital switches deployed by a cellular operator. AirTouch has been at the forefront of efforts to use cellular spectrum more efficiently and has worked closely with Qualcomm, Inc. on CDMA (code division multiple access) shared spectrum and digital technology over the past several years. AirTouch is also a partner in GLOBALSTAR, a satellite system designed to use CDMA technology and shared spectrum. Therefore, AirTouch's engineering credentials qualify it to comment on the wireless issues raised by this Further Notice. In addition, AirTouch is supported in its comments on economic and regulatory issues by the views of three distinguished antitrust economists with extensive backgrounds in telecommunications -- Professor

Jerry A. Hausman,[3] Professor R. Preston McAfee and Dr. Michael A. Williams.[4]

Background

The Omnibus Budget Reconciliation Act of 1993 amended Sections 3(n) and 332 of the Communications Act of 1934 and gave the Commission broad responsibilities to create a comprehensive framework for the regulation of mobile radio services. In a Notice of Proposed Rule Making issued in this proceeding on October 8, 1993, the Commission solicited comments on a broad array of issues as input into its ultimate determination of how various mobile services should be regulated in light of these statutory amendments. AirTouch, then PacTel Corporation, submitted comments on those issues. On February 3, 1994, the Commission adopted a Second Report and Order[5] which implemented those statutory amendments and established a regulatory regime for newly defined CMRS. The Further Notice proposes additional modifications to existing technical, operational and licensing rules for mobile services necessary for the transition to the new CMRS regime.

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[3] Hausman Affidavit, attached hereto as "Attachment 1."

[4] McAfee and Williams Report, attached hereto as "Attachment 2."

[5] Second Report and Order, Implementation of Sections 3(n) and 332 of the Communications Act, Regulatory Treatment of Mobile Services, GN Docket No. 93-252, 9 FCC Rcd 1411 (1994), released March 30, 1994.

The Commission now seeks comment on a number of specific questions relating to competition among CMRS providers. For example, the Commission requests comments which would help identify specific factors for determining whether one CMRS service is competitive with another CMRS service. In addition, the Commission raises a series of questions relating to proposed limits on the amount of CMRS spectrum that any licensee may aggregate in a given geographic area. These latter issues are of great concern to AirTouch and are the issues to which AirTouch addresses its comments.

The Commission seeks to determine whether, as a consequence of its allocation of spectrum to PCS and the regulatory regime established in the Second Report and Order, there is a "potential" for licensees of CMRS to exert market power by aggregating CMRS spectrum. The Commission proposes several alternative limits on the total amount of CMRS spectrum that may be licensed to a single entity in a geographic area.

In introducing the spectrum-limit issue, the Commission's Further Notice recognizes the evolution and innovation currently taking place in the newly defined CMRS services. The Commission points out that it has "dramatically increased" the amount of spectrum available to CMRS providers with its allocation of 120 MHz of spectrum for licensed broadband and 2 MHz of spectrum for narrowband PCS.[6/] In addition, the Commission has stated that the goal of its regulatory decisions

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[6/] Further Notice, ¶ 86.

relating to CMRS is to encourage and facilitate the advent and development of an array of diverse CMRS service offerings.[7/] And in its Broadband PCS proceeding, the Commission has recognized the value of allowing licensees to offer multiple services as a way to foster investment in and development of CMRS.[8/]

Despite its recognition and its goal, the Commission suggests that permitting a licensee to acquire a "large" amount of spectrum, relative to other licensees, could "potentially foreclose" opportunities for others to compete in the same geographic area.[9/] The Commission even suggests that, by aggregating portions of spectrum devoted to CMRS services that do not currently compete with each other, a licensee could exercise market power with respect to all CMRS services.[10/]

One specific proposal is to use the 40 MHz limit already applicable to broadband PCS aggregation as a basis for the CMRS cap, adjusting it upward "slightly" to allow licensees the flexibility to provide both broadband and narrowband services.[11/] The Commission seeks comment on whether all CMRS spectrum should be included, regardless of whether the services

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7/ Id., ¶ 87.

8/ Id.

9/ Id., ¶ 91.

10/ Id.

11/ Id., ¶ 93.

provided compete or not.[12/] The Commission specifically asks whether satellite services should be included under the proposed cap.[13/]

On the assumption that it will impose a spectrum cap, whether on all CMRS or on specific CMRS services, the Commission requests views on the percentage of ownership interest that an individual or entity should be allowed to hold in a CMRS licensee before that licensee's spectrum use is fully attributed to the entity or individual for purposes of spectrum aggregation.[14/]

CMRS Spectrum Caps

Addressing first the general question whether the Commission should extend the spectrum caps previously imposed on cellular and PCS services to cover all CMRS services, AirTouch submits that to do so would be arbitrary and capricious and would lack any basis in economic theory, antitrust law or fact. The competitive concerns put forward by the Commission as the impetus for this proposal are not applicable to this particular industry. Furthermore, even if there were a basis for an initial choice of a particular limit, that basis would be quickly eroded by the pace of developments in wireless services. Consequently, the Commission would be required to monitor developments and constantly adjust the limit.

12/ Id., ¶¶ 94, 96.

13/ Id., ¶ 97.

14/ Id., ¶ 101.

In this proceeding, AirTouch does not call for reconsideration of the Commission's previous decision to impose a spectrum-ownership limit on PCS and cellular service, although AirTouch opposes unwarranted, prospective regulation of the structure of any market. As a general matter, AirTouch believes that competition among CMRS offerings would best flourish if providers were left free of such artificial and arbitrary strictures as spectrum-ownership or firm-size limits. Until the time when the Commission revisits spectrum limits as a policy matter, however, any such limits must be applied fairly and equally to all providers of competing services. Therefore, any spectrum caps applicable to cellular and PCS providers must also apply to providers of enhanced specialized mobile radio services (ESMR) which are substitutable for cellular service and the upcoming PCS services. While AirTouch believes that the Commission's proposed spectrum limitation is itself arbitrary (as well as counterproductive and anticompetitive), so long as it applies to the activities of cellular and PCS providers, the Commission would be acting arbitrarily, capriciously and inequitably to permit competing ESMR providers to escape it.

Next, AirTouch submits that there is no basis for extending the existing spectrum limits beyond the providers of cellular, PCS, and competing ESMR services. Other existing CMRS services, such as paging,[15/] are not competitive with cellular,

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[15/] Not only does paging not compete with broadband services such as cellular, ESMR and broadband PCS, but also there are already (continued...)

PCS or ESMR.[16/] Nor are satellite services likely to be economic substitutes for terrestrial cellular service.[17/] Simply stated, CMRS services are diverse and do not constitute a single economic market. The Commission does not know -- because the marketplace has yet to determine -- the demand characteristics and supply factors that will determine which CMRS services compete with each other. To impose global limits over ownership of all CMRS spectrum, covering both competing and noncompeting services, would be without basis and irrational.

What is known is that the emerging CMRS services are destined to change and evolve in the near future, probably dramatically. As the affidavit of Professor Hausman describes, technological advances are actually increasing the capacity of spectrum allocated for CMRS services; SMRs have evolved into ESMRs, with increased capacity and services that are substitutable for cellular services; and the PCS auction will soon establish four to six significant new providers of services to compete with cellular service in each geographic area.[18/] Because the competitive dynamics among CMRS services and the demand characteristics of CMRS users are not fully understood at

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[15/] (...continued)
numerous competitors (often eight to ten in each major market) and lots of capacity (i.e., 120 channels). As a result, there is absolutely no basis whatsoever to impose any spectrum cap upon paging services.

[16/] Hausman Affidavit at 6; McAfee and Williams Report at 16-17.

[17/] McAfee and Williams Report at 17-19.

[18/] Hausman Affidavit at 3-5.

this time and are certain to change, it is especially clear that it would be irrational and unsupportable to overlay a unified, rigid structure on all CMRS services. To dictate the number and size of providers before it becomes clear how, for instance, economies of scale and scope will relate to efficiency and to the incentives to innovate in this industry would be very short-sighted, risky and unwarranted.[19/] In light of the dynamic growth and technological change taking place in CMRS services, the Commission should certainly not extend spectrum caps to all CMRS because there is no evidence that use of such a restrictive device will help consumers.[20/]

The actual impact of spectrum caps seems likely to be contrary to the Commission's goal of fostering innovation, investment, diversity and competition. Many providers of CMRS services have accumulated substantial technical and marketing expertise that is transferable from one service to another, even though those services do not compete with each other. Much of this experience has been gained in the developmental phase of services; to take advantage of such experience could materially advance the development of a diverse array of innovative CMRS services. Incumbent providers are likely to identify opportunities to develop additional services and are likely to have greater incentives than other firms to innovate, to invest, and to offer multiple services. Yet incumbent firms may be

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[19/] McAfee and Williams Report at 11-14.

[20/] Id. at 11.

precluded from pursuing promising opportunities because their entry into new services would require more spectrum than the cap would allow. This restraint on efficient providers would be antithetical to the Commission's overarching objective of achieving diversity.[21/]

The Commission justifies its restrictive proposal with the concern that CMRS licensees potentially could exert market power by aggregating spectrum, even across noncompeting services. Yet there appears to be no source of the market power to which the Commission alludes.

The competitive concerns associated with aggregations of ownership, whether in terms of absolute size or in terms of relative market shares, are twofold: one is that the firms in a market will be able to collude; the other is that one firm may have the power unilaterally to raise prices or reduce output. These are the two concerns addressed by the Department of Justice/Federal Trade Commission 1992 Horizontal Merger Guidelines. For several reasons, however, neither of these competitive effects is likely to occur in CMRS. Collusion is very unlikely in CMRS because (a) the actual and potential providers of CMRS services are too numerous and too diverse to have common interests that would bind them to any collusive course, (b) the rapid rate of technological change makes any collusive agreement difficult to achieve and sustain, (c) not all

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[21/] Hausman Affidavit at 11-12.

CMRS providers compete with each other, and (d) any licensee that engages in collusive behavior risks the loss of its license.

As Professor Hausman points out, the field of wireless communication is technologically and competitively dynamic.[22/] Technological and competitive developments include the advent of digital services that expand spectrum capacity, the transformation of specialized mobile radio services into enhanced specialized mobile radio services which compete with cellular service, and the imminent arrival of at least four and potentially six new providers of PCS, which is also substitutable for cellular, in each geographic area.[23/] This rate of technological evolution creates incentive for competitors to "leap frog" each other with introduction of technological advances in the marketplace.[24/] In addition, the prospective entry of substantial new competitors undercuts any notion that incumbent firms in the CMRS field could successfully maintain a collusive course of action. Beyond this, there is no single CMRS market in which all providers compete; instead, there are numerous services, some of which are substitutes and some of which are not. As the Commission acknowledges by its requests for comments on the issue, very little is known about the factors that determine the degree of competitiveness among the various existing and future CMRS offerings. In such an environment,

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[22/] Id. at 3-5.

[23/] Id. at 4.

[24/] McAfee and Williams Report at 6.

where the interests of providers are diverse, collusion is unlikely.[25/] Finally, as noted, the threat of losing its license is a sufficient disincentive to discourage any licensee from engaging in collusive activity.

For many of the same reasons, the unilateral acquisition and exercise of power over prices or output by any given provider is also very implausible. First, no provider has or is likely to acquire the share of any market which would be recognized under antitrust law as a monopoly or near-monopoly position. Even if the amount of spectrum allocated to a provider is used as a proxy for market share (which is not valid in light of technologies that can expand the capacity of spectrum), the proposed spectrum limits are well below the levels recognized as safe harbors in merger law enforcement.[26/] Second, even if a single provider approached such a share of the spectrum, as mentioned, CMRS technology actually enables competitors and potential competitors to expand capacity -- through digital technology and shared spectrum. Under these conditions, as Professor Hausman explains, no firm would acquire the unilateral ability to reduce the output (or raise the price) of CMRS.[27/] Still further, there are no barriers to entry into CMRS; under such conditions, no firm could raise prices to anticompetitive levels without attracting substantial new competitors to undercut

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[25/] Id.

[26/] Hausman Affidavit at 7-9.

[27/] Id. at 9.

the pricing. As Professor Hausman describes, NexTel, DialCall and Onecomm have already entered into the supply of CMRS services and have done so using relatively little spectrum.[28/] This is further evidence that outside firms would not be foreclosed or barred from entry into CMRS markets.[29/] Indeed, the high level of interest in entering into PCS services is well known to the Commission and provides a glimpse of the likelihood that additional entry would occur in the event of any attempted exercise of market power.

The only competitive concern identified by the Commission is that potential providers of CMRS might be foreclosed from entering into a CMRS market by the aggregation of spectrum on the part of incumbent providers.[30/] However, in light of the ability of both actual and potential competitors to expand the CMRS supply and in light of the absence of barriers to entry, such foreclosure is not likely to occur.

If the type of foreclosure envisioned by the Commission is believed to result from exclusionary conduct, it can be monitored by the Commission and addressed by the antitrust enforcement authorities. Indeed, the Commission has already indicated that it will monitor the state of competition in CMRS

[28/] Id. at 4, 9.

[29/] Id. at 9.

[30/] Further Notice, ¶ 91.

to ensure diversity and competitive service, regardless of its decision on spectrum caps.[31/]

If the real source of the market power about which the Commission is concerned is simply the amount of spectrum that will be available for acquisition by a potential entrant into CMRS, this concern seems to ignore the more important issue of the state of competition among the incumbent providers. In addition, it is premature for the Commission to attempt to predetermine the amounts of spectrum that will be necessary to permit new entry, since the amount of spectrum required to provide some services, such as low-earth-orbiting satellite services, has not even been determined. Nor is it known which portions of the spectrum will be used to provide new services, such as feeder links for satellite services. In any event, as with merger enforcement in general, the preferred approach to such concerns is to review all acquisitions and transfers of spectrum on a case-by-case basis. Some acquisitions will be procompetitive; some could in fact raise antitrust concerns; but an analysis of procompetitive and anticompetitive effects of the holdings of CMRS spectrum by a specific competitor should be made on a case-by-case basis. No acquisition or transfer of ownership in this or any other industry should be judged solely on the basis of firm size. Yet the Commission's proposal would prospectively prejudge the competitive effects of all spectrum aggregations on the basis of a single factor.

[31/] Id.

As Professor McAfee and Dr. Williams point out (and as the Department of Justice/FTC Horizontal Merger Guidelines make clear), nonstructural factors, such as buyer characteristics, the rate of technological change, efficiency gains, and entry conditions can trump structural factors.[32/] Indeed, the Commission itself has previously recognized that industry dynamics can outweigh concerns about an industry's structure; that is, in allowing cellular providers to acquire PCS licenses in their service areas, the Commission recognized that those providers' expertise, economies of scope and previous investments would contribute positively to the development of PCS.[33/]

The Commission's solicitude for preserving abstract entry opportunities for a certain number of alternative providers of CMRS is more likely to dampen competition than to preserve it. Attempting to fix the number of competitors in a market through rigid firm-size limits is actually contrary to the goal of antitrust law, which is to preserve competition, not competitors. Reserving "space" in the CMRS field for inefficient or noninnovative providers would be counterproductive and even anticompetitive. It would also be detrimental if, in order to develop and offer innovative services, incumbent providers would have to reduce their output of existing services.

[32/] McAfee and Williams Report at 7-8.

[33/] Second Report and Order, Amendment of the Commission's Rules to Establish New Personal Communications Services, GN Docket No. 90-314, released October 22, 1993, FCC 93-451, 8 FCC Rcd 7744.

The Commission has repeatedly asserted its intention to "ensure that competition and market forces drive business and consumer decisions."[34/] Ironically, though, the Commission's spectrum-cap proposals would restrict and suppress market forces by limiting providers' ability to offer diverse CMRS services, thereby potentially hobbling the strongest competitors and choking off productive investment.

For all the foregoing reasons, AirTouch submits that there is no basis for extending the existing spectrum limits (applicable to cellular and PCS spectrum) to any CMRS services other than ESMR services; as explained, ESMRs compete directly with cellular service and must, as a matter of equitable regulation, be included in any caps that are applicable to cellular providers.

Satellite Services

The Commission has specifically asked whether satellite service should be included in the proposed cap and, if so, which satellite services.[35/]

AirTouch strongly believes that no spectrum cap should be imposed upon satellite services. Satellite services are simply not economic substitutes for broadband CMRS.[36/]

[34/] FCC News Release, "FCC Adopts Modifications to PCS Band Plan; Creates Significant Benefits for Consumers and Businesses (Gen. Docket 90-314)," June 9, 1994, at 2.

[35/] Further Notice, ¶ 97.

[36/] McAfee and Williams Report at 17-19.

Therefore, satellite services should not be included in any market defined in terms of competition among cellular, PCS and ESMR services. The use of spectrum to provide satellite services by a provider of broadband CMRS services should not raise any of the aggregation concerns apparently underlying the spectrum-cap proposal. There is little or no risk of foreclosure of potential providers of satellite services because the shared-spectrum CDMA technology used by some satellite operators permits practically unlimited use of that spectrum. Accordingly, whatever concerns the Commission may harbor about the amounts of spectrum held by other CMRS providers, those concerns should have no application to the use of spectrum by satellite licensees.[37/]

Attribution Rules

Finally, the Commission has invited comments on the percentage ownership interest that an individual or entity should be allowed to acquire or hold in a CMRS license before that licensee's spectrum use is attributed to the acquirer for purposes of applying the cap. The proposed five percent attribution standard is the same limit the Commission has adopted in PCS.

At the outset, AirTouch urges that, whatever the Commission decides with respect to its proposed five percent attribution rule, the Commission should not limit further the coexisting attribution rule (adopted in licensing broadband PCS)

37/ Id.

that an entity does not trigger the 35 MHz restriction on spectrum-ownership until it reaches a 20 percent ownership interest in a cellular licensee.

As for the five percent attribution rule, AirTouch submits that, in the context of CMRS, the proposed rule is too restrictive and is likely to defeat the Commission's primary goal of fostering a diverse and competitive array of services. The likely effect of the five percent rule will be to constrain investment in CMRS by the firms with the greatest accumulated experience in various existing CMRS services. Such a restriction would prevent the formation of consortia,[38/] which may offer the most efficient vehicles for investment in the CMRS activities and which may provide the most productive engines for innovation.

The Commission's policy in CMRS regulation is "to ensure that regulation is perceived by the investment community as a positive factor that creates incentives for investment in the development of valuable communications services."[39/] The Commission has stated its intention that "[i]nvestors will be able to make funding decisions based upon their assessment of market forces and their analysis of the strengths and weaknesses of the various telecommunications companies competing in the multiple services marketplace."[40/] These objectives will be

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38/ Id. at 20.

39/ Second Report and Order at 1421.

40/ Id.

frustrated if the Commission imposes an unwarranted and overly restrictive attribution rule. The proposed rule would in fact deny investors the ability to make decisions based on the competitive potential of innovative CMRS services and would thereby chill investment incentives.

The five percent attribution rule, as pointed out by Professors Hausman and McAfee and Dr. Williams, would deprive firms of the ability to achieve maximum efficiencies and economies of scope (that is, economies achieved across multiple services).[41/] From an international trade perspective, such a handicap would be punitive to U.S. firms attempting to compete in world markets. Investment and sales opportunities in wireless services and products occur in a competitive international marketplace. Currently, U.S. firms are among the leaders in developing mobile services and equipment, but such advantages would be sacrificed by the imposition of disincentives to ownership and investment. Adoption of an artificially restrictive attribution rule could disadvantage U.S. providers of CMRS services in competition with foreign firms.

In light of future advantages that the American CMRS industry stands to garner in a highly competitive world market for CMRS offerings, no nonstatutory rule should be adopted that would unnecessarily dampen the flow of capital (foreign and

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[41/] Hausman Affidavit at 10-12; McAfee and Williams Report at 20-23.

domestic) into these emerging technologies and services, prevent the achievement of efficiencies by U.S. exporters, or promote the noneconomic diversion of available capital into foreign ventures.

Respectfully submitted,

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June 20, 1994

Affidavit of Professor Jerry A. Hausman

JERRY A HAUSMAN, being duly sworn, deposes and says:

1. My name is Jerry A. Hausman. I am MacDonald Professor of Economics at the Massachusetts Institute of Technology in Cambridge, Massachusetts, 02139.

2. I received an A.B. degree from Brown University and a B.Phil. and D. Phil. (Ph.D.) in Economics from Oxford University where I was a Marshall Scholar. My academic and research specialties are econometrics, the use of statistical models and techniques on economic data, and microeconomics, the study of consumer behavior and the behavior of firms. I teach a course in "Competition in Telecommunications" to graduate students in economics and business at MIT each year. Mobile telecommunications is one of the primary topics covered in the course. I also have significant experience in analyzing mergers. I have published academic papers on the proper methods to analyze mergers, and I have given invited seminars to the U.S. Department of Justice and the American Bar Association on the subject. I was a member of the editorial board of the Rand (formerly the Bell) Journal of Economics for the past 13 years. The Rand Journal is the leading economics journal of applied microeconomics and regulation. In December 1985, I received the John Bates Clark Award of the American Economic Association for the most "significant contributions to economics" by an economist under forty years of age. I have received numerous other academic and economic society awards. My curriculum vitae is included as Exhibit 1.

3. I have done significant amounts of research in the telecommunications industry. My first experience in this area was in 1969 when I studied the Alaskan telephone system for the Army Corps of Engineers. Since that time, I have studied the demand for local measured service, the